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IS 13463 (1992): Polyamide (nylon 6) material for moulding and extrusion [PCD 12: Plastics]



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भारतीय मानक

संचकन और बहिवेधन के लिए
पोलिएमाइड (नाइलॉन 6) संचकन सामग्रियाँ — विशिष्ट

Indian Standard

POLYAMIDE (NYLON 6) MATERIALS FOR
MOULDING AND EXTRUSION —
SPECIFICATION

UDC 678.675.033.3

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BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Plastics Sectional Committee had been approved by the Petroleum, Coal and Related Products Division Council.

The term 'Nylon' is applied to synthetic polyamides that have fibre, film and/or plastic forming properties. All 'Nylons' have in the polymer materials the amide ($-\text{CO}-\text{NH}-$) group, the link that joins the repeating hydrocarbon units of various lengths. The intermediates for nylons are dicarboxylic acids, diamines, amino-acids and lactams. Nylons are usually identified numerically using the number of carbon atoms in the basic units of the polymer chains. A duplex digit is used where the nylon is derived from a diamine and diacid, the first digit of the duplex referring to the diamine and the second digit referring to the diacid. For example, the polymer from hexamethylene diamine and adipic acid is termed as Nylon 66, that from hexamethylene diamine and sebacic acid Nylon 610, that from caprolactam Nylon 6.

Nylon possesses high impact resistance, toughness, low coefficient of friction, resistance to most common solvents, self-extinguishing and possesses good machinability.

Variations in moulding conditions produces more variations in all properties. To avoid this the material may preferably be processed in screw type semi-automatic/automatic injection moulding machines where the temperature variations are controlled within $\pm 5^\circ\text{C}$ from the set point. The melt temperature of the polymer shall be as near to its melting point as possible.

Nylons should be melt processed at relatively low moisture content. Since nylons are hygroscopic, care shall be taken to ensure an adequately low moisture level normally not exceeding 0.2 percent. Resins from the manufacturer's package usually is dry enough but predrying is recommended on perforated trays where the resin is collected to a height not exceeding 2.5 cm for approximately 2 to 4 hours at temperature not exceeding 85°C in air circulating oven. Predrying can also be done safely at a faster rate in vacuum oven at a temperature ranging from $80-100^\circ\text{C}$ for couple of hours.

The Committee considered it relevant to include the various requirements of reinforced and filled nylons which are widely used at present and became popular since 1987. However, after generating sufficient data on the requirements to be met by the filled and reinforced nylons and after development of the standardized test methods thereof the same will be included at a later date in the standard.

For the convenience of fabricators details regarding post treatment of moulding namely, annealing, conditioning machining and service temperature are given in Annex A. In general, the maximum operating temperature (continuous) in the case of Nylon 6 is observed to be 90°C .

For the purpose of deciding whether a particular requirement of the standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be done in accordance with IS 2 : 1960 'Rules for rounding off numerical values (revised)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

POLYAMIDE (NYLON 6) MATERIALS FOR MOULDING AND EXTRUSION — SPECIFICATION

1 SCOPE

The standard prescribes the requirements, method of sampling and test for Nylon-6 materials for moulding and extrusion.

2 REFERENCES

The following Indian Standards are necessary adjuncts to this standard:

<i>IS No.</i>	<i>Title</i>
196 : 1966	Atmospheric conditions for testing
266 : 1977	Sulphuric acid (<i>second revision</i>)
517 : 1986	Methanol (<i>second revision</i>)
867 : 1963	Method of test for phenolic moulding materials
2267 : 1972	Specification for polystyrene moulding materials
2824 : 1975	Method for determination of comparative tracking index of solid insulating materials under moist conditions
2828 : 1964	Glossary of terms used in plastic industry
3396 : 1979	Method of test for volume and surface resistivities of solid electrical insulating materials
4486 : 1967	Recommended methods for the determination of the permittivity and dielectric dissipation factor of electrical insulating materials at power, audio and radio frequencies including meter wavelength
4905 : 1968	Methods for random sampling
5210 : 1969	High impact polystyrene sheet
6746 : 1972	Unsaturated polyester resin systems for low pressure fibre-reinforced plastics
8543 (Part 4/ Sec 1) : 1984	Methods of testing plastics: Part 4 Short term mechanical properties, Section 1 Determination of tensile properties

IS No.

Title

12247 : 1988	Specification for Nylon-6 polymers for its safe use in contact with foodstuffs, pharmaceuticals and drinking water
13360 (Part 1) : 1992	Plastics — Methods of testing: Part 1 Introduction
13360 (Part 5/ Sec 13) : 1992	Plastics — Methods of testing: Part 5 Mechanical properties, Section 13 Determination of Rockwell hardness
13360 (Part 6/ Sec 6) : 1992	Plastics — Methods of testing: Part 6 Thermal properties, Section 6 Flammability by oxygen index
13360 (Part 6/ Sec 10) : 1992	Plastics — Methods of testing: Part 6 Thermal properties, Section 10 Determination of melting point (melting temperature or range) of semicrystalline polymers
13464 : 1992	Specification for polyamide (nylon 66) materials for moulding and extrusion

3 TERMINOLOGY

For the purpose of this standard the definitions given in IS 2828 : 1964 shall apply.

4 REQUIREMENTS

4.1 Description

The material shall be in the form of granules/chips of natural colour unless otherwise specified by the purchaser. Sizes of the granules/chips are to be agreed between the purchaser and the supplier.

4.2 The material shall also comply with the requirements given in Table 1 when tested according to the method prescribed in col 4 and 5.

4.3 Colour

The colour/shade of the material shall be natural unless otherwise specified by the purchaser.

4.4 Contact with Foodstuffs, Pharmaceuticals and Drinking Water

When the products are used in contact with foodstuffs, pharmaceuticals and drinking water, its requirements with respect to material shall also be met as per IS 12247 : 1988.

Table 1 Requirements for Polyamide (Nylon 6) Moulding Materials
(Unfilled Materials, Natural Colour)
(Clause 4.2)

Sl No.	Characteristic	Requirement	Method of Test, Ref to	
			Indian Standard (4)	Annex/Clause (5)
(1)	(2)	(3)		
i)	Relative density at 27°C	1·12-1·14	2267 : 1972	A-9
ii)	Melting point, °C	215-220	13360 (Part 6, Sec 10) : 1992	Method A
iii)	Water absorption (24 h immersion at 27°C), percent, <i>Max</i>	2·5	—	B
iv)	Rockwell hardness 'R' scale, <i>Min</i>	97	13360 (Part 5/Sec 13) : 1992	—
v)	Tensile strength at yield, MPa, <i>Min</i>	64	8543 (Part 4/Sec 1) : 1984	—
vi)	Elongation at break, percent, <i>Min</i>	20	do	—
vii)	Izod impact strength (Notched), KJ/m ² , <i>Min</i>	3·8	2267 : 1972	A-6
viii)	Flexural modulus, MPa, <i>Min</i>	2 350	5210 : 1969	C
ix)	Heat deflection temperature under load			
a)	at 1·80 MPa, °C, <i>Min</i>	60	6746 : 1972	J
b)	at 0·45 MPa, °C, <i>Min</i>	160		
x)	Flammability :			
a)	Self extinguishing	Self extinguishing	2267 : 1972	A-10
b)	Oxygen index, percent, <i>Min</i>	23·5	13360 (Part 6/Sec 6) : 1·92	—
xi)	Dielectric strength, kV/mm, <i>Min</i>	16	4486 : 1967	—
xii)	Volume resistivity, ohm-cm, <i>Min</i>	10 ¹⁴	3396 : 1979	—
xiii)	Tracking index, V, <i>Min</i>	600	2824 : 1975	—
xiv)	Relative viscosity at 25°C	2·5-5·5	—	C

NOTE — The required values of all properties are for dry as moulded (DAM) material having moisture content not more than 0·2 percent.

5 PACKING AND MARKING

5.1 Packing

The material shall be suitably packed in polyethylene bags in 10 kg tin containers or in polyethylene lined paper with multi-wall sacks or any other suitable method facilitating easy handling and providing protection against ingress of moisture.

5.2 Marking

Each container/package shall be clearly marked with the following information:

- a) Indication of the source of manufacture;

- b) Colour/shade;
c) Month and year of manufacture;
d) Batch number; and
e) Net mass.

5.2.1 The containers/packages may also be marked with the Standard Mark.

6 SAMPLING

For the purpose of ascertaining the conformity of a consignment of materials to this specification, the scale of sampling and criteria for conformity shall be as given in Annex D.

ANNEX A
(Foreword)

POST TREATMENT OF MOULDINGS

A-1 ANNEALING

Dimensional changes may also be exhibited by mouldings when they are subjected to high temperatures.

- i) The release of strains introduced into the mouldings by different rates of contraction on cooling that is quenching strains.

- ii) The rearrangement of the molecular orientation introduced during the flow of the molten material into the mould and frozen-in during cooling.

Quenching strains may be released and rearrangement of the molecular orientation may be accelerated by annealing the mouldings at

temperatures below the softening point of material. The mouldings are immersed in non-oxidising fluids like synthetic microcrystalline waxes for 10 minutes per 3.2 mm section thickness at 160°C. The moulding should be cooled slowly either in the heating fluid or in draught free surroundings.

A-2 CONDITIONING NYLON

A-2.1 Conditioning is a process in which moisture is added as rapidly as possible to dry articles. As a rule, conditioning is carried out until the moisture content of the article is in equilibrium with ambient conditions, which are characterized by a given temperature and relative humidity.

<i>Equilibrium Moisture Content at 23°C and 50 percent RH</i>	<i>Immersed in Water</i>
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Nylon 6	2.8 to 3.5 percent	9 percent Max
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A-2.1.1 The properties of dry nylon articles are different to those of moist. The absorption of moisture by dry articles during use thus often gives rise to impermissible changes in properties and dimensions, particularly in impact strength. In addition, a demand imposed on many machine parts is that their dimensions, strength and rigidity must remain constant within comparatively narrow limits. This may not be achieved unless the moisture content is close to the equilibrium value.

A-2.2 Conditioning in Hot Water

The article is conditioned by immersing it in a covered insulated water bath that is thermostatically controlled at 80 to 90°C and the

amount of moisture pick-up may be determined simply by weighing. Conditioning in boiling water also acts as an annealing process. If the raw stock used for preparation of nylon articles by machining has not been conditioned by the manufacturer beforehand, it should be treated at the very latest before it is machined for the last time.

An idea of the times required for conditioning as function of the wall thickness and conditioning temperature may be derived from Fig. 1 and 2.

There is not much point in over conditioning nylon articles that is having too high a moisture content. The excess moisture is again released until the value corresponding to that of the environment is attained.

A-2.3 Moisture Equilization After Conditioning

It may be ascertained by weighing that an article conditioned does actually contain the desired amount of moisture. But this does not give any information how the moisture is distributed throughout the cross-section of the articles. Although all efforts are made to ensure uniform distribution, it is never really achieved immediately after conditioning unless the wall thickness of the articles is less than about 3 mm. In thicker articles just removed from the condition bath, the moisture content is much higher than desired in the superficial layers, and the core is almost dry. If articles of this nature are kept in air after conditioning, part of the water in the most saturated superficial layers would escape to the air, and part of the excess would penetrate further into the dry core. Experiments have revealed that up to 50 percent of the water

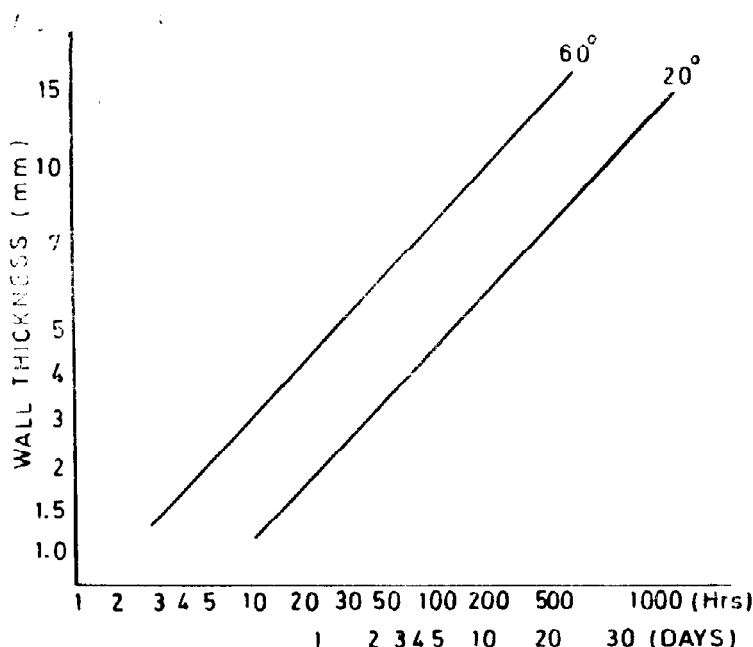
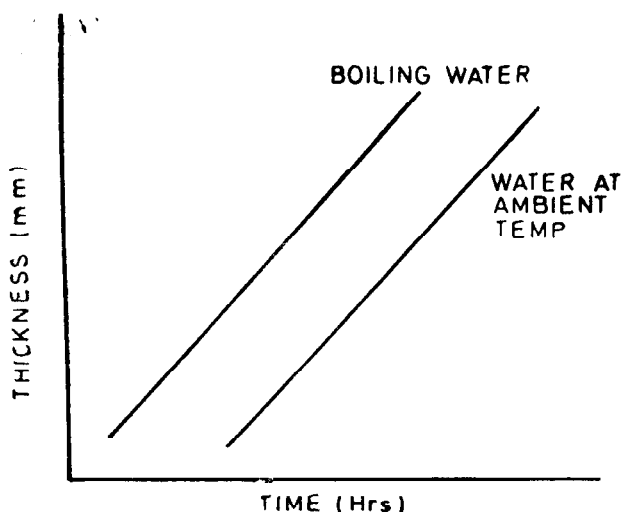


FIG. 1 CONDITIONING TIME IN WATER FOR DIFFERENT WALL THICKNESS



Media : Water, Temperature : Ambient/90°C, Time : Until a weight gain of 2.5 to 3.0 Percent

FIG. 2 CONDITIONING

absorbed by thick articles during conditioning may be given off again. For this reason, it is advisable to keep nylon mouldings packed under moist conditions after conditioning namely in polyethylene bags. There are no objections to the release of slight amounts of water from the saturated superficial layers because it has been demonstrated in practices that a moisture content of 2.5 percent is quite adequate in most cases for nylon-6 mouldings. This figure corresponds roughly to equilibrium moisture content at 20°C and 40 to 50 percent relative humidity.

A-2.4 The Performance of Conditioned Articles

Moisture penetrates very slowly into dry articles kept in air. It is released from conditioned mouldings just as slowly if the ambient conditions change. As a consequence, the moisture content of conditioned articles does not closely follow fluctuations in atmospheric humidity. In fact, there is a considerable lag. Since the change in length is small ($\Delta V \approx 3 \Delta L$) fluctuations in ambient conditions may usually be neglected in practice. For example, the moisture content of a 5 mm nylon-66 article would change by only about ± 0.4 percent if it were exposed to long cycles of severe changes in ambient conditions. The associated change in length would be less than ± 0.23 percent ($= 1/3 \Delta V$). As opposed to this, changes in dimensions caused by thermal expansion are of the order of 0.18 percent for a change in temperature.

A-3 MACHINING

A-3.1 All the machining operations used in ordinary metal working may be applied to the nylons but the tools and their setting, speeds, feeds, etc, should be adapted to account for the differences in properties between metals and plastics.

A-3.1.1 Conductivity

The low thermal conductivity of polyamides compared to metals reduces the rate of dissipation of the heat generated between the tools and the work-piece and tends to create local overheating of the machined part.

Thermal conductivity:

Plastics	0.1 to 0.6 k cal/M ² /K
Metals	40 to 400 k cal/M ² /C

A-3.1.2 Melting Point

The melting point of nylons is very much lower than that of any of the common structural metals. Thus the heat generated in machining tends to degrade, soften and even melt the nylon.

Polyamide (Nylon 6) — 215°C.

A-3.1.3 Stiffness

The room temperature stiffness of unfilled nylons is much less than that of any of the metals commonly machined. At the elevated temperatures often generated by machining, the stiffness is even less; full support shall therefore be given to the work piece and low tool pressure employed when machining components where tight tolerance are to be maintained.

Unfilled plastics :	$E \approx 100 - 4\,000 \text{ MN/m}^2$
Filled plastics :	$E \approx 1500 - 15\,000 \text{ MN/m}^2$
Steel :	$E \approx 200\,000 \text{ MN/m}^2$

A-3.1.4 Dimensional Changes Due to Moisture Absorption and Thermal Expansion

Nylons start to pick up moisture until they have reached equilibrium water content. A dimensional

expansion accompanies water absorption but nylon undergo a far greater dimensional change as a result of thermal expansion. For example, a moulding takes approximately one year to absorb 3 percent moisture giving an expansion of 0.3 percent. The same moulding would experience a similar dimensional change when subjected to a temperature rise of about 30°C.

Equilibrium Water Absorption

Nylon 6 : 2.5 to 3 percent at 23°C and 50 percent RH, 3 to 10 percent *Max* immersed in water.

Thermal Expansion

Nylon 6 : $9 \text{ to } 10 \times 10^{-5}/^{\circ}\text{C}$

Steel : $1 \times 10^{-5}/^{\circ}\text{C}$

A-3.2 During machining take care of :

- Sharp tools;
- Low rates of feeding;
- Good cooling (use cooling air jet or cooling fluids);
- Machining in steps;
- Uniform, low clamping force;

— Thin articles sometimes need:

- i) Special support
- ii) Low tool leads
- iii) Deformation under load during machining
- iv) Elasticity recovery
- v) Chip formation, use chip deflector or select right cutting speeds

— Blunt tools which rub and generate heat

A-4 SERVICE TEMPERATURE

As the temperature increases and the modulus of elasticity thus decreases, the risk of permanent deformation of moulding by stressing becomes greater. In this case, it is important to observe the heat distortion temperature, that is temperature at which the article is still sufficiently liquid to suffer no permanent deformation under normal internal stresses or external loads. The heat distortion temperatures of nylons is 140 to 170°C. Very slightly stressed loadings may withstand even higher temperatures — in fact temperature of more than 200°C and severely stressed articles may deform at temperatures as low as 60°C.

ANNEX B

[Table 1, Item(iii)]

DETERMINATION OF WATER ABSORPTION AND WATER SOLUBLE MATTER

B-1 FORM OF TEST SPECIMEN

B-1.1 The specimen shall be a disc cut with knife-edged punch from moulded sheet of thickness 1.25 ± 0.15 mm. The diameter of the punch at its cutting edge shall be 50.0 ± 0.2 mm.

B-1.2 The surfaces of all specimens shall be free from dust, oil or other matter that might interfere with the absorption of water.

B-2 NUMBER OF TEST SPECIMENS

Two specimens shall be used.

B-3 PROCEDURE

B-3.1 All weighings shall be to the nearest milligrams and a weighing bottle shall be used throughout.

B-3.2 The specimen shall be dried over calcium chloride or other desiccant for 24 ± 1 h at room temperature and atmospheric pressure. It shall be weighed (W_1) immediately after its removal from desiccator. It shall then be immersed for 24 ± 1 h in distilled water at $27 \pm 1^{\circ}\text{C}$. Precautions shall be taken to prevent specimens from making contact over any substantial area with one another or with the container. The specimen shall be dried with a clean cloth, or

filter paper and not more than 5 minutes after removal from the water, shall be reweighed (W_2).

B-3.3 The specimen shall then be dried at atmospheric pressure and room temperature over calcium chloride or other desiccant and reweighed (W_3) at daily intervals until consecutive weighings do not differ by more than 2 mg.

B-3.4 The water absorption of the specimen shall be ($W_2 - W_3$) and the water soluble matter ($W_1 - W_3$). Both shall be expressed in milligram. The water absorption of the material under test shall be arithmetic mean of the water absorption of the test specimens. The water soluble matter of the material under test shall be the arithmetic mean of the water soluble matter of the test specimens.

B-4 REPORT

The report shall state:

- i) The water absorption and the water soluble matter of the material expressed in percentage by mass; and
- ii) The individual test results.

ANNEX C

[Table 1, Item (xiv)]

DETERMINATION OF THE RELATIVE VISCOSITY OF SOLUTION OF POLYAMIDE (NYLON 6) IN SULPHURIC ACID

C-1 GENERAL

The determination of the relative viscosity is a routine test of the production and serves as a tool to control the degree of polymerization.

C-2 SUMMARY OF THE METHOD

A determined amount of the sample is dissolved in 96 ± 0.05 percent sulphuric acid and the time within which the solution flows from the upper to the lower mark of an Ubbelohde Viscometer is measured. The same procedure is carried out with the solvent and then the relative viscosity (η_{rel}) is calculated.

C-3 REAGENTS

C-3.1 Sulphuric Acid, concentrated (96 ± 0.05 percent) (*see* IS 266 : 1977).

C-3.2 Methanol — *See* IS 517 : 1986.

C-3.3 Chromic Acid

C-4 APPARATUS

C-4.1 Analytical Balance

C-4.2 Thermostatically controlled water bath (capable of maintaining a constant temperature of $25 \pm 0.05^\circ\text{C}$).

C-4.3 Ubbelohde Viscometer, capillary dia 1.0 mm.

C-4.4 Stop Watch (accuracy 1/10 second).

C-4.5 Erlenmeyer Flask, having standard B₂₄ joint with glass stopper (100 ml capacity).

C-4.6 Pipettes, 25 ml.

C-4.7 Vibrating Machine

C-5 PROCEDURE

C-5.1 About 0.25 g of the sample is weighed to the nearest 0.1 mg into a 100 ml Erlenmeyer flask as quickly as possible so that the sample does not absorb moisture from the air. 25 ml of concentrated sulphuric acid (96 ± 0.05 percent) is added to the flask and the flask is stoppered.

C-5.2 The flask along with the sample and the acid is shaken by means of a vibrating machine till the sample is completely dissolved (time taken is about 4-5 hours).

C-5.3 The Ubbelohde Viscometer is carefully filled with the solution and the viscometer is placed in the thermostatically controlled water bath kept at a temperature of $25 \pm 0.05^\circ\text{C}$. After 20 minutes when the solution in the viscometer has attained the constant bath temperature of $25 \pm 0.05^\circ\text{C}$ suck the solution higher than the upper mark in the viscometer by means of vacuum whereby the pressure-equilizing tube is closed with the finger.

C-5.4 Allow the solution to recede. Note the time in seconds within which the solution flows from the upper to the lower mark of the viscometer (X). Repeat the procedure thrice and note the time of flow. These three values shall not differ by more than 0.3 seconds amongst each other. Repeat the procedure in case deviation of more than 0.3 seconds is observed among the three values.

C-5.5 Carry out a blank with sulphuric acid (96 ± 0.05 percent) in the viscometer following the same procedure and note the time of flow (Y) in seconds.

NOTES

1 Care must be taken that the bottle containing the acid is closed immediately after use to avoid absorption of moisture from the air, which may change the viscosity of the acid.

2 Determination of blank shall be carried out once in a week and as and when a new container of acid is used.

C-6 CALCULATIONS

$$\text{Relative viscosity } (\eta_{rel}) = \frac{X}{Y}$$

where

$$X = \frac{X_1 + X_2 + X_3}{3}$$

$$\text{and } Y = \frac{Y_1 + Y_2 + Y_3}{3}$$

ANNEX D (Clause 6)

SAMPING OF POLYAMIDE (NYLON 6) MOULDING MATERIALS

D-1 GENERAL REQUIREMENTS OF SAMPLING

D-1.1 Samples shall not be taken in an exposed place.

D-1.2 The sampling instrument, which shall be made of glass, stainless steel or any other material on which polyamide moulding material has no action, shall be clean and dry.

D-1.3 Precautions shall be taken to protect the samples, the material being sampled, the sampling instrument and the containers selected for sampling from adventitious contamination.

D-1.4 To draw a representative sample, the contents of each container selected for sampling shall be mixed as thoroughly as possible by suitable means.

D-1.5 The samples shall be placed in suitable, clean, dry, air-tight sheet metal or glass containers on which the material has no action.

D-1.6 Each sample container shall be sealed air-tight with a stopper after filling and marked with full details of sampling, the date of sampling and the month and year of manufacture of the material.

D-2 SCALE OF SAMPLING

D-2.1 Lot

All the containers in a single consignment of the material drawn from a single batch of manufacture shall constitute a lot. If a consignment is declared or known to consist of different batches of manufacture, the batches shall be marked separately and the groups of containers in each batch shall constitute separate lots.

D-2.2 Samples shall be tested for each lot for ascertaining the conformity of the material to the requirements of this specification.

D-2.3 The number of containers to be selected from a lot shall depend upon the size of the lot and shall be in accordance with Table 2.

Table 2 Number of Containers to be Selected

Lot Size (1)	Sample Size (2)
Up to 25	3
26 to 50	4
51 to 100	5
101 and above	7

D-2.4 These containers shall be cosen at random from the lot and in order to ensure the random-

ness of selection, the procedure given in IS 4905 : 1968 may be followed.

D-3 TEST SAMPLES AND REFEREE SAMPLE

D-3.1 Preparation

To prepare a set of test samples, draw with an appropriate sampling instrument from freshly opened containers which have been selected for sampling, an equal number of scoopfuls of material from any point at least 75 mm below the surface and 75 mm above the bottom of large containers, and from any point at least 25 mm below the surface and 25 mm above the bottom of small containers. The sample prepared by mixing the portions from each container shall be not less than eight times the quantity which is estimated to be required for carrying number of reduced samples. Each set of these reduced samples shall constitute the test sample.

D-3.2 Three sets of test samples, each not less than twice the quantity required for the purpose of testing, representative of each selected container (see D-3.1) shall be transferred immediately to thoroughly dried containers, which shall be sealed air-tight with an appropriate stopper. These containers shall be marked with all the particulars of sampling given under D-1.6. One set of the test samples shall be sent to the purchaser and one to the supplier.

D-3.3 Referee Samples

The third set of the test samples, bearing the seals of the purchaser and the supplier shall constitute the referee sample, to be used in case of dispute between the purchaser and the supplier. It shall be kept at a place agreed to between the purchaser and the supplier.

D-4 NUMBER OF TESTS

D-4.1 Tests for all the requirements shall be conducted on composite samples.

D-5 CRITERIA FOR CONFORMITY

D-5.1 All the containers selected in col 2 of Table 2 shall be subjected to visual examination. The test on composite sample shall be conducted only when the material is found to be satisfactory after visual examination.

D-5.2 The lot shall be declared as conforming to the requirements of this standard if all the test results conducted on composite sample satisfy the requirements given in Table 1.

Standard Mark

The use of the Standard Mark is governed by the provisions of the *Bureau of Indian Standards Act, 1986* and the Rules and Regulations made thereunder. The Standard Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well defined system of inspection, testing and quality control which is devised and supervised by BIS and operated by the producer. Standard marked products are also continuously checked by BIS for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

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TO

**IS 13463 : 1992 POLYAMIDE (NYLON 6) MATERIALS
FOR MOULDING AND EXTRUSION — SPECIFICATION**

(*Foreword, second para, fourth line*) — Substitute 'lactams' for 'lactams'.

(*Foreword, second para, last line*) — Substitute 'caprolactam' for 'caprolactum'.

(*Foreword, third para, first line*) — Insert 'properties like' after 'Nylon possesses'.

(*Foreword, third para, last line*) — Delete 'possesses'.

(*Foreword, seventh para, last line*) — Substitute '80°' for '90°'.

(*Page 3, clause A-2.2, third line*) — Substitute '90°C' for '80 to 90°C'.

(*Page 3, Fig. 1*) — Substitute '60°C' and '20°C' for '60°' and '20°'.

(*Page 4, Fig. 2*) — Substitute 'WATER AT 90°C' for 'BOILING WATER'.

(*Page 4, clause A-3.1.1, line 7*) — Substitute the following for the existing:

'Plastics 0.1 to 0.6 k cal/M²/°C'.

(*Page 5, clause A-3.2*) — Substitute dash '—' for SI No. (iii), (iv) and (v).

(*Page 5, clause A-4, seventh line*) — Substitute 'stiff' for 'liquid'.

(PCD 12)